Space Weather Forecast

Issued on Sunday, 05 November 2023 at 01:26 Local

This forecast provides a four day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

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Space Weather Forecast Headline: G1/G2 Minor/Moderate geomagnetic storms expected and chance of G3/Strong storming on days 1-2 (05-06 Nov) due to coronal mass ejection arrival. Chance of Moderate Class flares.

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Low, with a number of low-level Common class flares observed. There are eight sunspot regions on the visible disc. The largest is in the southeast disc, dominated by a large leader spot, however this remains mostly stable and otherwise simple. There is another region in the southwest disc, which is comprised of a smaller string of spots. This has a mixed magnetic polarity region near its trailer suggestive of slightly increased complexity in comparison, although this region also appears stable. The only notable growth has been in a small region in the northwest. No Earth-directed coronal mass ejections (CMEs) have been observed, with the large CME to the northwest assessed as missing. There are a large number of filaments currently on the Earth-facing disc however. These are lines of material that are held together by the Suns magnetic field, and can produce CMEs if they erupt.

Solar Wind / Geomagnetic Activity: Solar winds at L1, showed the arrival of a CME, likely from a filament eruption on 31 Oct, with some potential that this included a glancing CME that is currently expected on 05 Nov. The speed persisted at background, below 350 km/s, however the main feature was a significant increase in the density of the solar wind, which is the number of particles observed that make up the wind. Total interplanetary magnetic field (IMF) strength, also rose, from initially weak to become Strong, peaking at around 04/1745 UTC. The important north-south component was predominately negative (southward) orientated, and became moderate for much of the time between 04/1600-2200 UTC. This rotated positive (northward) after 04/2200 UTC. Geomagnetic activity was Quiet (Kp1-2) until 04/1800UTC, then G1 Minor Storm 04/1800-2100 UTC and Active 04/2100-0000UTC. Aurora was observed across northern Scotland, and clearly visible from Shetland.

Energetic Particles / Solar Radiation: The count rate of energetic particles (high energy protons) remained close to background levels with no solar radiation storms observed.

Four-Day Space Weather Forecast Summary

Solar Activity: Low to Moderate solar activity is expected, with a chance of isolated Moderate flares.

Solar Wind / Geomagnetic Activity: There are two further potential CME arrivals, both on day 1 (05 Nov). The first is low confidence, from 02 Nov, with some possibility it may have already arrived. The second is the CME from the large filament eruption on 03 Nov. This is currently forecast to arrive 05/1800 UTC, with ongoing effects expected on 06 Nov. Otherwise, onset of the fast winds from a coronal hole are also expected to bring a further increase to solar wind speeds through day 3 and into day 4 (07-08 Nov). Geomagnetic activity is forecast to initially be Quiet to Active, as current CME enhancement eases. Further CME arrivals then likely increase activity, with a chance of G1 Minor Storms from the first CME, increasing to Active to G2 Moderate Storms, with a chance of G3 Strong Storms from the second. These most likely late

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day 1 and early day 2 (05-06 Nov). This has the potential to bring visible aurora as far south as northern England and Northern Ireland. Activity easing later day 2 and into day 3 (06-07 Nov) to be Quiet to Unsettled, with Active intervals possible. However, further Active spells then possible from the arrival of coronal hole sourced fast solar winds, with a slight chance G1 Minor storm intervals.

Energetic Particles / Solar Radiation: The count rate of energetic particles (high energy protons) is forecast to persist at around background with no solar radiation storms occurring.

Geomagnetic Storms:

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	Yes	80	70	20	10
Strong	G3	No	20	30	1	1
Severe	G4	No	5	5	1	1
Extreme	G5	No	1	1	1	1

Radio Blackouts - X Ray Flares:

X Ray Flares Probability	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	R1-R2 M Class	No	30	30	30	30
Very Active	R3 to R5 X	No	1	1	1	1

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Solar Radiation Storms - (High Energy Protons):

Radiation Storms Probability (Exceedance)	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	**≥ S1**	No	2	2	5	5
Very Active	**≥ S3 ***	No	1	1	1	1
* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)						

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